

# THE JOURNAL OF THE SOCIETY OF AUTOMOTIVE ENGINEERS

INDEX TO VOLUME X, JANUARY-JUNE, 1922

	PAGES		PAGES		PAGES
<i>January</i>	1-76	Ceiling formula	473	Position of foot-rest, steering-wheel and controls	118
<i>February</i>	77-148	Classification of performance formulas	470	Present practice of top	366
<i>March</i>	149-228	Climbing calculations	472	Rear-axle spring-suspension	463
<i>April</i>	229-302	Design of sights	63	Relation between fluid friction and transmission efficiency	193
<i>May</i>	303-442	Estimation of ground speed	63	Seat width	118
<i>June</i>	443-546	Minimum and maximum speeds	470	Simplicity of apparatus a prime consideration	23
		Passenger comfort	27	Some notes on the California top	366
		Performance formulas	469	Standardization of control dimensions	120
		Powerplant requirements	29	Stoppage ability	280
		Simplified methods of sighting	63	Tire reaction	465
		Single and multi-engine	26	Upholstery shape	117
		Use of the wind tunnel	469	Use of pressed-steel parts	341
		Air Service, cross-country flying by the	289	What increased efficiency would mean	2
		Alcohol for motor fuel	364	Who must have	97
		Allied debts	439		
		Alternative apparatus for determining volatility of fuels	19	<i>Automotive Industry</i>	
		American Engineering Standards Committee, representatives appointed	11	Service-man's critical estimate of engineering	263
		American marksmanship	134	Use of molybdenum steel in the	340
		American Petroleum Institute Fuel Session	1	Automotive materials session	91
		Ampere-hour meter	503	Autorifle, Thompson	134
		Annealing-oven improvements	58	Available supply of petroleum	187
				Aviation sessions, coming	145
<i>Addresses</i>		<i>Annual Meeting, S A E</i>			
At annual dinner	94	Airplane engine session	78		
At annual meeting	82, 83	Automotive materials session	91		
Bachman, B B	95	Body engineering session	86		
Beecroft, David	82	Business session	78	<i>Aviation</i>	
Grant, R H	149	Carnival	94	Commercial considerations	27
Horning, H L	83	Dinner	94	Cross-country flying by the Air Service	289
Kettering, C F	94	Fuel and engine session	92	Danger in flying	25
Moulton, H G	165	Lubrication session	87	Essentials of transportation	30
Quamme, E G	169	Meetings Committee report	85	First incentive	466
Adequate gating	54	Membership Committee report	84	Function of the wing joint	467
Advantages of automatic rifle firing	144	Motor-truck transportation session	88	Government aid for	413
Advantages to dealer of standardized body production	184	Passenger-car session	93	Importance of versatility	467
Advantages to user of standardized bodies	186	Reduced railroad fares	93	Landing-fields	25
		Research department plans outlined	78	Passenger comfort	27
		Research session	90	Progress	79
		Reviewed	77	Single and multi-engine planes	26
<i>Aeronautic Division, S A E</i>		Sections Committee report	85, 145	Trend of design	27
Activities	294	Treasurer's report	85	Trend of development	25
Personnel	113, 291, 508	Anti-knock compounds	204	Truth about commercial	51
Report at annual meeting	121	Anti-knock research	356		
Aeronautic session at summer meeting	445	Apparatus layout for gearset tests	194		
		Argentina and other competitors	170		
		Artificial-heat drying	391		
<i>Aeronautics</i>		Association, facility of	534	<i>Axle and Wheels Division, S A E</i>	
Balloon instruments and methods	61	Atoms	62	Activities	294, 435
Wind-tunnel	146	Automatic charging of motive-power storage-batteries (H M Beck)	499	Personnel	113, 475, 508
Agricultural and financial situation improving	169			Report at semi-annual meeting	476
				Subject assigned	291
				Axles, rear, spring-suspension	463
<i>Agricultural Power Equipment Division, S A E</i>		<i>Automobiles</i>			
Activities	294	Accessibility	263		
Personnel	113, 291, 477	Adaptability of molybdenum steel to frame construction	340	<i>B</i>	
Report at semi-annual meeting	477	Basic materials in painting	13	Bachman, B B, address	95
Agricultural production	52	Body seating-dimensions	117, 394		
Air-cooled engine development (C L Lawrence)	135, 405	Bolts, cap-screws and nuts	264	<i>Ball and Roller Bearings Division, S A E</i>	
Air-cooled engine, influence of gas velocity through the valves on the performance of an	254	Brakes	273	Activities	70, 71, 72, 294, 298
Air-cooled versus water-cooled engines	140	Care of the finish	15	Personnel	113, 291, 508
		Chrome-molybdenum-steel applications from the consumer's viewpoint	384	Report at annual meeting	121
		Color harmony	131	Balloon instruments and methods	61
		Color psychology	131	BARNARD, D P, 4TH, ON TOTAL SENSIBLE HEATS OF ENGINE FUELS AND THEIR MIXTURES WITH AIR	65
		Color schemes	132	Basic industry	178
		Color values	132	Basic machine elements, standards	271
		Crane spring-suspension	464	Basic of optimism	150
		Cushion height, depth and slope	117	Battleships versus airplane carriers	230
		Dashboard instruments	265	Bearings, friction tests of metal for	34
		Decoration of interiors	133	BECK, H M, ON AUTOMATIC CHARGING OF MOTIVE-POWER STORAGE-BATTERIES	499
		Depth of front and rear compartments	120	BEECROFT, DAVID, ON THE STATUS OF THE ENGINEER IN AUTOMOTIVE ECONOMICS	82
		Development history of top	366	Belt-speed standards	271
		Drying and surfacing of paints and varnishes	15	Benefits of weak fuel-mixtures	313
		Engineering systems of application of paint	13	BERRY, O C, ON MANIPOLD VAPORIZATION AND EXHAUST-GAS TEMPERATURES	171, 402
		Engineers part	98	Bibliography on brakes	508
		Fabrics	133	Big inventories maintained	149
		General take-up adjustment	265	Blanks, rolled forging	45
		Harmony in upholstery	131, 400		
		Head-room	118		
		Inaccessible parts necessitating dismantling	267		
		Joy-riding over	98		
		Manufacture and application of varnishes and paints	12, 388		
		Materials in paints and varnishes	12	<i>Bodies</i>	
		Methods of application of paints	14	Advantages to dealer of standardized	184
		More efficient	1	Advantages to user of standardized	186
		New system of spring-suspension for	463	Built according to specification	180
		Overhead camshaft engines	489	Chassis builder constructing	179
		Part-capacity production	98		
		Passenger-car brakes	376		
<i>Airplanes</i>					
Applications of formulas	474				
Battleships versus carriers	230				
Bomb dropping	63				





## INDEX TO VOLUME X

541

*Die Rolling*

Continuous (G R Norton)	43, 374
Cost of operation	46
Equipment used	46
Forging blanks	45
Forming effected in one pass	45
Improvements in the art	43

*Dinners*

Addresses at annual	94
Chicago service	164
Minneapolis tractor	169
Direct cooling versus cooling by conduction	232

*Displacement Diagram*

Derivation	358
Study	359
Distribution of heat in a high-speed engine	327
Distribution of income from production	226
Diversified-farming requirements	177, 337
Division meetings, tentative schedule of S A E	292
Domestic progress	167
Drawing temperatures of steel, quenching and	48
Drift bomb-sights	64
Drivers and mechanics	427

*Drives*

Location of camshaft	491
Silent chain and spur gear	491
Spiral bevel gear	494
Unusual forms of camshaft	495
Drop-forging practice (J H Nelson)	207, 379
Dry and wet mixtures of fuels	192
Drying, artificial-heat	391

**E**

Economic balance necessary, return of	100
Economic efficiency of motor transport	418
Economics and crowbars	96
Economics of Motor Transport (M C Horine)	415

*Economics*

World a unit	166
World situation	165

*Economy*

Manufacturing	151
Possible effects of water injection on engine power and	290
Education, engineering	41
Effect of compression-ratio on output, fuel-consumption and wall-temperature	243
Effect of oil-return holes	515
Effect of phosphorus and sulphur in steel	291
Effect of side-clearance and ring motion	516
Effect of spark-plug position on power output and fuel-consumption	254
Effects of mixture-strength and cooling air-supply upon cylinder temperature	232
Effects of water injection on engine power and economy, possible	290
Efficiency under reduced loads	328

*Efficiency*

Economic, of motor transport	418
Gearset	198
Highway	419
Influence of compression-ratio on	326
Mechanical of engines	318
Relation between fluid friction and transmission	193, 372
Transport	419
Vehicle	420
What increased automobile, would mean	2
EGTVEDT, C L, ON FLIGHTY REFLECTIONS	466

*Electric Vehicle Division, S A E*

Activities	294, 434
Personnel	113, 291, 508
Subjects assigned	508

*Electrical Equipment Division, S A E*

Activities	69, 70, 71, 294, 298, 300, 433, 434, 436
Personnel	114, 433, 476
Report at annual meeting	122

Report at semi-annual meeting	476
Subjects assigned	508
Unaccepted recommendations	128

*Electrification*

Advantages of	42
Change will come piecemeal	42
Fuel saving about one-third	42
Problem one of finance	42
Railroad	42
Endurance tests with a cooled drum	158

*Engine Division, S A E*

Activities	70, 294, 434, 435
Personnel	114, 291, 476
Report at annual meeting	122
Report at semi-annual meeting	478
Subjects assigned	508
Unaccepted recommendations	129
Engineer, how can, help business	149
Engineering systems of application of paint	13

*Engineering*

Business and	300
Education	263
Service-man's critical estimate of	263

*Engineers*

As managers	16
In public discussion	120
International affiliation	83
Period	152
Status in automotive economics	82

*Engines*

Acceptance tests	458
Air-cooled development	135, 405
Air-cooled versus water-cooled	140
Aircraft size and cooling	205
Air measurement	321
Anti-knock compounds	204
Anti-knock research	356
As a brake	283
British experiments on air-cooled	136
British tests of air-cooled	136
Cooling factors	141
Cooling surface	242
Cooling systems	81
Cylinder materials	243
Detonation	308
Development procedure	457
Direct cooling versus cooling by conduction	232
Distribution of heat in a high-speed	327
Effect of compression-ratio on output, fuel-consumption and wall-temperature	243
Effect of mixture-strength and cooling air-supply upon cylinder temperature	232
Effect of spark-plug position on power output and fuel-consumption	254
Efficiency under reduced loads	328
External oil leaks and breather discharge	522
Flight and service tests	461
Governors	81
Heat to be dissipated	231
Importance of piston-ring fit	510
Indicators for high-speed	353
Influence of compression-ratio upon power output and efficiency	326
Influence of cylinder size on performance	327
Influence of cylinder temperature on power output	327
Influence of gas velocity through the valves on the performance of an air-cooled	254
Injection-type automotive	188
Internal-combustion	96
Internal-combustion characteristics	21
Internal-combustion fuels	187, 363
Internal energy of the working fluid	324
Lubricating systems	511
Manifold vaporization and exhaust-gas temperatures	171, 402
Mechanical efficiency	318
Method of developing aircraft	457
Methods of measuring detonation	7, 374
Molecular movement during combustion in closed systems	357
New designs	82
Over-dimensioned and over-compressed	204
Overhead camshaft passenger-car	489
Photographic recording of data	351

Pistons	264
Possible effects of water injection on power and economy	290
Progress in cooling	140
Recent aircraft developments	204
Recent research work on the internal-combustion	305
Relation between fluid friction and transmission efficiency	193, 372
Ring and cylinder contact effects	517
Silent chain and spur gear drives	491
Simplicity of automobile a prime consideration	23
Some aspects of air-cooled cylinder design and development	231
Spectroscopic investigation of internal combustion	218, 383
Spiral bevel gear drive	494
Standard test	458
Stationary internal-combustion	80
Stratification	311
Stratified charge	331
Sulzer marine diesel	112
Tappet-rods and overhead camshafts	489
Tear-down and inspection	460
Temperature distribution	232
Total sensible heats of fuels and their mixtures with air	65
Turbulence and combustion-chamber design	315
Types of air-cooled	138
Types of cylinder	246
Types of cylinder-head	242
Unusual forms of camshaft drive	495
Valve mechanisms	496
Equalizers for brakes	281
Equipment for testing brake-linings	154
Essentials of farm life	222
Estimation of ground speed	63

*Europe*

Conditions in central	166
Industrial conditions in	116
Evaporation, heat required	19
Exhaust-gas temperature tests	173
Exhaust-gas temperatures, manifold vaporization and	171, 402
Exhaust-valve cooling in cylinders	252
Expense, motor bus	203

*Export Trade*

German	450
Importance of	166
Mechanical inspection	64
Exposed types of brakes	278
External oil leaks and breather discharge	522

**F**

Fabrics	133
Facility of association	534
Factors controlling oil-pumping	509
Factory team-play	150
Farm animals, number and value of	295
Farm-implement finance	338
Farm implement, relation of tractor to	177
Farm marketing, cooperative	462
Farmers, organization by	178
Farmer's reward	456

*Farming*

Basic industry	178
Diversified requirements	177, 337
Essentials of life	222
Implement finance	338
Implement requirements	178
Row-crop cultivation	177
Finance, farm implement	338
Finance Committee, S A E, personnel	142
Financial situation improving, agricultural and	169
Finning, methods of	237
First incentive to aviation	466

*Flame-Front*

Pressure drop in	361
Pressure in	359
Flighty reflections (C L Egtvedt)	466
Flying, danger in	25
Foot-rest, position of	118

*Forgings*

Heat-treatment of finished	207
Testing finished	210
Forming effected in one pass	45

## Formula

Airplane performance (E P Warner)	469
Application of, to airplanes	473
Brake area	378
Brake-drum size	280
Ceiling	473
Classification of airplane performance	470
Foundry difficulties	53
Foundry policy and purchasing agent	55
Four-wheel brakes	378
Frames, molybdenum steel for	283, 340

## Frames Division, S A E

Activities	
Personnel	300
Report at annual meeting	114, 291, 508
Freight rates and coal prices	125
Friction and viscosity (W H Herschel)	170
	31, 369

## Friction

Coefficient of, for brake-linings	155
Losses due to load	198
Testing of bearing metals	34
Front-wheel brakes	283

## Fuel and Engine Session

Annual meeting	92
Summer meeting	446

## Fuel-Consumption

Effect of compression-ratio on	243
Effect of spark-plug position on	254
Fuel standards for use in measuring detona-	9
tion	

## Fuels

Alcohol for motor	
Alternative apparatus for determining	364
volatility	
Available supply of petroleum	19
Benefits of weak mixtures	187
Better gasoline wanted	313
Boiling point and specific gravity	2
Characteristics	188
Chemical stability	21
Chicago session	22
Cracking	1
Determining partial vaporization	188
Detonation characteristics of some	20
blended motor	
Dry and wet mixtures	451
Ease of starting	192
85-per cent point	18
Gravity and viscosity	18
Heat required for evaporation	21
How can we measure the true volatil-	19
ity of motor?	
Ignition	6
Internal-combustion engine	19
Internal energy of the working fluid	187, 363
Manifold vaporization and exhaust-	324
gas temperatures	
Marketing policy	171, 402
Mean volatility	24
Measurement of effective volatility	308
Motor from coal	20
Properties of materials used	414
Questionnaire results	452
Research work	22
Saturation point and famine	305
Saving about one-third with railroad	24
electrification	
Shale oil	42
Simplicity of apparatus a prime con-	191
sideration	
Substitute	23
Tests	189
Tests of total heats	172
their sensible heats of engine, and	66
Uniformity essential	65
Unsaturated hydrocarbons	21
Volatility the main dependency	6
Function of the wing joint	21
Future brakes	467

## G

Galvanometer, string	
Garage equipment and body service	188

## Gasoline

Better wanted	
Boiling points and specific gravity	2
Cracking	188
Mixers	82
Gating, adequate for castings	54
Gearset experiments	194

## Gearset

Efficiency	
Experiments with	198
Results of tests	194
Routine tests of	196
German export trade	196
Germany, buying by	450
GILKEY, W K, ON SPECTROSCOPIC INVE-	99
STIGATION OF INTERNAL COMBUSTION	218, 383
GODDARD, GEORGE, E, ON BODY SEATING-	
DIMENSIONS	117, 394
Goods bought only with goods	99
Government aid for aviation	413
Governors on engines	81
Grain, marketing	41
GRANT, R H, ON HOW THE ENGINEER CAN	149
HELP BUSINESS	21
Gravity and viscosity	220
Gun, super-machine	

## H

HALLETT, CAPT G E A, ON METHOD OF	
DEVELOPING AIRCRAFT ENGINES	457
Hardening steel, carbonizing and, ef-	50
fects of	
Harmony in car upholstery (R S Quaint-	131, 400
ance)	
Head-room	118

## Heat

Distribution of, in a high-speed engine	327
Required for evaporation of fuels	19
To be dissipated	231
Total sensible, of engine fuels and	65
their mixtures with air	
Heat-treatment of finished forgings	207
HELDT, P M, ON OVERHEAD CAMSHAFT	
PASSENGER-CAR ENGINES	489
HELDT, P M, ON VALUE OF STANDARDS IN	
TRACTOR MANUFACTURE	270
HERON, S D, ON SOME ASPECTS OF AIR-	
COOLED CYLINDER DESIGN AND DEVEL-	
OPMENT	231
HERSCHEL, WINSLOW H, ON VISCOSITY	
AND FRICTION	31, 369
Highway engineering and transport in-	
struction	272
Highway transportation as it affects the	
automotive engineer (E W Templin)	212

## Highways and Roads

Determining type	
Efficiency	24
Engineering and transport instruction	419
Limitation of weight	272
Methods of construction	425
Transportation as it affects the auto-	425
motive engineer	
Highways committee, Government, rep-	212
resentative	
Highways Committee, S A E, personnel	11
Hitches, standards	291
HORINE, M C, ON ECONOMICS OF MOTOR	
TRANSPORT	271
HORNING, H L, ON INTERNATIONAL AF-	
FILIATION OF ENGINEERS	415
Hot-plate tests	83
House Committee, S A E, personnel	172
How are we to know when business has	142
really turned the corner (A R Marsh)	
How the engineer can help business	97
(R H Grant)	

## I

Idle working people	
---------------------	--

## Ignition

Characteristics	
Difference in fuels	21
Forms of	19
IKERT, B M, ON SERVICE-MAN'S CRITICAL	80
ESTIMATES OF AUTOMOTIVE ENGINEER-	
ING	
Illumination of buses	263
Impact tests of tires	397
Importance of export trade	214
Importance of piston-ring fit	166
Importance of versatility	510
Improved business in prospect	467
Inaccessible parts necessitating dis-	152
mantling	

## Income

Distribution from production	226
Rural and urban	101
Indicator method of determining detona-	7
tion	

Indicators for high-speed engines	353
Industrial conditions in Europe	116
Industry in unemployment	224
Industry in Middle West	176
Influence of welfare work	468
power output and efficiency	
Influence of cylinder size on performance	326
Influence of cylinder temperature on	327
power output	
Influence of gas velocity through the	327
valves on the performance of an air-	
cooled engine	
Influence of oil and water on coefficient	254
of friction of brake-linings	
Influence of oil viscosity and effects of	158
dilution	
Injection-type automotive engine	521
	188

## Inspection

Mechanical, in export trade	64
Raw stock	207
Instruments and methods, balloon	61
Interchangeable manufacture	143
Internal-combustion engine	96
Internal-combustion engine fuels (C A	
Norman)	187, 363
Internal energy of the working fluid	324
International affiliation of engineers	
(H L Horning)	83
Intersection athletics at summer meet-	
ing	
Inventories maintained, big	535
	149

## Iron and Steel Division, S A E

Activities	294, 299
Personnel	114, 291, 478
Report at annual meeting	125
Report at semi-annual meeting	479
Subject assigned	291
Iron, oxygen in	414

## Isolated Electric Lighting Plant Division, S A E

Activities	294
Personnel	114, 291

## J

JACKSON, WALTER, ON PAST, PRESENT	
AND FUTURE OF THE MOTOR-OMNIBUS	200, 395
Jitney competition	201
JONES, G DOUGLAS, ON THE RELATION OF	
THE TRACTOR TO THE FARM IMPL-	
EMENT	177
Joy-riding over	98

## K

KEGERREIS, C S, ON MANIFOLD VAPORI-	
ZATION AND EXHAUST-GAS TEMPERA-	
TURES	171, 402
Kettering, C F, address	94

## L

Lack of improvement in railroad	221
Landing-fields	25
Law of supply and demand	116
LAWRENCE, C L, ON AIR-COOLED ENGINE	
DEVELOPMENT	135, 405
Legislation, motor bus	201
Letter ballot on adoption of standards	260

## Lighting Division, S A E

Activities	69, 294
Personnel	114, 480
Report at annual meeting	126
Report at semi-annual meeting	480
Lines of necessary research	420
Listening method of determining deton-	
ation	
Load, friction losses due to	7
Losses, friction, due to load	198
	198

## 267 Lubricants

Characteristics of oil	21
Differences in oiliness of different,	
shown by tests	37
Incomplete film lubrication and the oili-	
ness of lubricating oils	36
Oils	6
Systems in engines	511



## INDEX TO VOLUME X

543

**Lubricants Division, S A E**

Activities	70, 294
Personnel	114, 291, 533
Report at semi-annual meeting	533
Lubricating systems	511
Lubrication session at annual meeting	87

**Lubrication**

Chassis	397
Desirable features of oil-friction testing machines	39
Engine	82
Incomplete film and the oiliness of lubricating oils	36
Viscosity and friction	31, 369
Viscosity effect in the complete-film regime	31
Lug attachments	271

**M**

MACCOULL, NEIL, ON RELATION BETWEEN FLUID FRICTION AND TRANSMISSION EFFICIENCY	193, 372
Machinability of castings	57
Magneto mountings standardized	270
Malleable-iron castings, pertinent facts concerning (Enrique Touceda)	53
Managers, engineers as	16
Manifold vaporization and exhaust-gas temperatures (O C Berry and C S Kegerreis)	171, 402

**Manifolds**

Vaporization and exhaust-gas temperatures	171, 402
Hot-spot	172
MANLY, C M, ON COMMERCIAL-BODY SUPPLY AND SERVICE	179
Manufacture and application of automobile varnishes and paints (L V Pulsifer)	12, 388
Manufacture, interchangeable	143
Manufacturing economy	151
Marketing grain	41
MARSH, A R, ON HOW ARE WE TO KNOW WHEN BUSINESS HAS REALLY TURNED THE CORNER?	97
Mean volatility	308
Mechanical efficiency	318
Mechanical inspection in export trade	64
Mechanical standardization	5

**Meetings**

Annual, S A E, reviewed	77
Chicago service	163
Council, S A E:	
December, 1921	11
January, 1922	142
March	291
May	508
Minneapolis tractor	167
S A E Council:	
December, 1921	11
January, 1922	142
March	291
May	508
Standards committee	121
Summer, announced	211, 229, 345
Tentative schedule of division	292

**Meetings Committee**

S A E, personnel	142
Report at annual meeting	85
Membership, increase of	84

**Membership Committee, S A E**

Personnel	142
Report at annual meeting	84
Membership roster, distribution	109
Membership roster to be maintained in prior form	269
Metal bodies	184
Method of controlling oil-pumping, novel	512
Method of developing aircraft engines (Capt George E A Hallett)	457
Methods of finning	237
Methods of measuring detonation in engines (Thomas Midgley, Jr. and T A Boyd)	7, 374
Methods of road construction	425
Methods of testing oil consumption	514
Middle West	176
MIDGLEY, THOMAS, JR, ON DETONATION CHARACTERISTICS OF SOME BLENDED MOTOR-FUELS	451
MIDGLEY, THOMAS, JR, ON METHODS OF MEASURING DETONATION IN ENGINES	7, 374

**MIDGLEY, THOMAS, JR, ON MOLECULAR MOVEMENTS DURING COMBUSTION IN CLOSED SYSTEMS****MIDGLEY, THOMAS, JR, ON SPECTROSCOPIC INVESTIGATION OF INTERNAL COMBUSTION**

Minneapolis tractor meeting	167
Minneapolis Tractor Show, S A E, standards exhibit at	225
Miscellaneous braking methods	286
Mixers, gasoline	82
Moisture-content of wood	392
Moisture in wood	348
Molecular movements during combustion in closed systems (Thomas Midgley, Jr.)	357
Molybdenum steel and manufacturing costs	341
Molybdenum-steel applications from the consumer's viewpoint, chrome	47, 384
Molybdenum-steel usage	47

**Motorboat Division, S A E**

Activities	294, 300, 437
Personnel	114
Subjects assigned	508
Motorboat field	80
Motorbus session at summer meeting	445
Motorcycle Division, S A E, personnel	114
Motor fuel from coal	414

**Motor-Omnibuses**

Competition	201
Expense	203
Future of	202
Legislation	201
Overland	201
Present of	200
Rates of fare	202
Motor-truck transportation session, at annual meeting	88

**Motor Vehicles**

Advantages of standardized bodies	184
Automatic charging of storage-batteries	499
Bodies built to specification	180
British standardization	142
Chassis builder constructing bodies	179
Chassis lubrication	397
Commercial-body supply and service	179
Custom-built bodies	181
Detonation characteristics of some blended fuels	451
Drivers and mechanics	427
Economic efficiency	418
Economics of transport	415
Efficiency	420
Future of omnibus	202
Illumination of buses	397
Jitney competition	201
Lines of necessary research for transport	420
Metal bodies	184
Municipal operation of buses in New York City	398
Noise measurements	198
Omnibus legislation	201
Operating costs of buses	398
Overland omnibus	201
Past, present and future of the motor-omnibus	200, 395
Pneumatic tires	426
Present of omnibus	200
Special features of bus chassis design	398
Standardization of commercial cars and trucks	186
Standardized sectional bodies	182
Moulton, H G, address	165
Multi-engine airplanes	26
Municipal operation of buses in New York City	398
MYERS, C T, ON PAINT PROTECTION FOR WOOD	348

**N**

NELSON, J H, ON DROP-FORGING PRACTICE	207, 379
New system of spring-suspension for automotive vehicles (H M Crane)	463
Noise measurements	198

**Nomenclature Division, S A E**

Activities	294, 437
Personnel	114, 291, 508

**Non-Ferrous Metals Division, S A E**

Activities	295
Personnel	115, 481, 508
Report at annual meeting	126
Report at semi-annual meeting	481
NORMAN, C A, ON INTERNAL-COMBUSTION ENGINE FUELS	187, 363

**NORTON, G R, ON CONTINUOUS DIE ROLLING**

Number and value of farm animals	43, 374
	295

**O**

Officers, S A E, for 1922	85, 102
Oil consumption (A A Bull)	513
Oil grooving	510
Oil-pumping (George A Round)	509

**Oils**

Consumption	513
Control of supply	518
Effects of side-clearance and ring motion	516
External leaks and breather discharge	522
Factors controlling pumping	509
Greater recovery of	6
Incomplete film lubrication and the oiliness of lubricating	36
Influence of viscosity and effects of dilution	521
Lubricating	6, 24
Lubricating characteristics	21
Novel method of controlling pumping	512
Pumping (G A Round)	509
Shale	191
Tests of consumption	514
Uniform testing-methods	5
Optimism, basis of	150
Organization by farmers	178
Ovens, improvements in annealing	58
Over-dimensioned and over-compressed engines	204
Overhead camshaft passenger-car engines (P M Heldt)	489
Overland motorbuses	201
Oxygen in iron	414

**P**

Paint protection for wood (C T Myers)	348
---------------------------------------	-----

**Paints**

Artificial-heat drying	391
Basic materials in automobile	13
Care of automobile finish	15
Drying and surfacing automobiles	15
Engineering systems of application of automobile	13
Manufacture and application of automobile varnishes and	12, 388
Materials in	12
Methods of application of automobile	14
Protection for wood	348
Protectiveness	349

**Parts and Fittings Division, S A E**

Activities, 69, 71, 295, 433, 434, 435, 436, 437, 438, 439	
Personnel	115, 433, 434, 484, 508
Report at annual meeting	127
Report at semi-annual meeting	484
Subjects assigned	508

**Passenger-Car Body Division, S A E**

Activities	69, 72, 295, 437
Personnel	115, 508, 532
Report at annual meeting	127
Report at semi-annual meeting	532
Subject assigned	508
Passenger-car brakes (J Edward Schlipper)	273, 376

**Passenger-Car Division, S A E**

Activities	298, 435
Personnel	115, 291
Passenger-car engines, overhead camshaft	489

**Passenger-Car Session**

Annual meeting	93
Summer meeting	446
Passenger comfort in airplanes	27
Past, present and future of the motor-omnibus (Walter Jackson)	200, 395
Pattern design of castings	54
Personnel of 1922 Standards Committee	113
Pertinent facts concerning malleable-iron castings (Enrique Touceda)	53, 375
Petroleum, available supply	187
Phosphorus and sulphur in steel, effect of	291
Photographic recording of engine data (Augustus Trowbridge)	351

**Physical Characteristics**

Castings	59
Steel	44
Pistons	264
Piston-ring	514
Piston-ring and cylinder contact effects	517

**Piston Rings**

Cylinder contact effects	517
Effect of oil-return holes	515
Effects of side-clearance and motion	516
Importance of fit	510
Oil grooving	510
Thin	516

**Pistons**

Experiments	319
Slipper aluminum	331
Pneumatic tires	426
Pneumatic truck tire	214
Position of foot-rest, steering-wheel and controls	118
Position of United States	166
Post-armistice business	149

**Power**

Influence of compression-ratio on	326
Influence of cylinder temperature on output	327
Possible effects of water injection on engine economy and	290

**Power Output**

Effect of compression ratio on	243
Effect of spark-plug position on	254

**Powerplant**

Aircraft, refinement	206
Requirements in airplanes	29
Pressure in the flame-front	359
Prices, freight rates and coal	170

**Production**

Agricultural	52
British ferrous-metal	100
Distribution of income from	226
Organization	224
Part-capacity, of automobiles	98
Progress in aviation	79
Progress in cooling engines	140
Propeller-shaft brakes	377
Propellers, test apparatus for models	534
Protected types of brakes	278
Protectiveness of paint	349
Publication Committee, S A E, personnel	142
Publications of interest to S A E members	73, 430
PULSIFER, L V, ON MANUFACTURE AND APPLICATION OF AUTOMOBILE VARNISHES AND PAINTS	12, 388
Purchasing agent, foundry policy and	55

**Q**

QUAINTANCE, R S, ON HARMONY IN CAR UPHOLSTERY	131, 400
Quamme, E G, address	169
Quenching and drawing temperatures of steel	48

**R**

Radiator Division, S A E, personnel	115, 291, 508
Railroad accommodations for summer meeting	449
Railroad electrification	42
Railroad transportation to summer meeting	346, 448

**Railroads**

Lack of improvement	221
Reduced fares for annual meeting	93
Rear-axle spring-suspension	463
Recent aircraft engine developments (C Fayette Taylor)	204
Recent research work on the internal-combustion engine (Harry R Ricardo)	305
Recovery in wheat-producing territory	170
Relation between fluid friction and transmission efficiency (Neil MacCoub)	193, 372
Relation of the tractor to the farm implement (G D Jones)	177
Reports of Divisions to Standards Committee	475

**Reports**

Divisions to Standards Committee	475
Meetings Committee, S A E, at annual meeting	85
Membership Committee, S A E, at annual meeting	84
Progress at semi-annual meeting on standards	475
Sections Committee, S A E, at annual meeting	85, 145
Standards Committee Division	475
Standards Committee, S A E, report at annual meeting	77
Treasurer's at annual meeting	85
Requisite conditions today	150
Research information service	111

**Research Session**

Annual meeting	90
Summer meeting	446
Research topics and suggestions	507

**Research**

Alcohol for motor fuel	364
Anti-knock	356
Fuel	305
Greater recovery of oil	6
Information service	111
Lines of necessary for motor transport	420
Paint protection for wood	350
Recent work on the internal-combustion engine (H R Ricardo)	305
Suggested problems for	290
Research Department, S A E, plans outlined	78
Return of economic balance necessary	100
RICARDO, HARRY R, ON RECENT RESEARCH WORK ON THE INTERNAL-COMBUSTION ENGINE	305
Rifle, advantages of automatic, firing	144
Rivet-holding ability of brake-linings	161
Roads	24

**Roads and Highways**

Determining type	24
Efficiency	419
Engineering and transport instruction	272
Limitation of weight	425
Methods of construction	425
Transportation as it affects the automotive engineer	212
Rolled forging blanks	45
Roster of membership to be maintained in prior form	269
ROUND, GEORGE A, ON OIL-PUMPING	509
Row-crop cultivation	177
Rural and urban incomes	101

**S****S A E**

Activities of the Sections	72, 145, 223, 296, 431, 535
Annual meeting reviewed	77
Automotive materials session at annual meeting	91
Body engineering session at annual meeting	86
Carnival at annual meeting	94
Chicago service meeting	163
Council meetings:	
December, 1921	11
January, 1922	142
March	291
May	508
Current standardization work	69, 224, 433
Fuel and engine session at annual meeting	92
Fuel and engine session at summer meeting	446
Lubrication session at annual meeting	87
Minneapolis tractor meeting	167
Motor-truck transportation session at annual meeting	88
Officers for 1922	85, 102
Passenger-car session at annual meeting	93
Passenger-car session at summer meeting	446
Reduced railroad fares for annual meeting	93
Reports of divisions to Standards Committee	475
Research session at annual meeting	90
Research session at summer meeting	446
Sections activities	72, 145, 223, 296, 431, 535
Sections officers	535
Standards committee report	77
Standards exhibit at the Minneapolis Tractor Show	225
Summer meeting announced	211, 229, 345
Summer meeting program	447

Safety code, abrasive wheel	430
Sales territory, selecting	151
Saturation point and fuel famine	24
SCHIPPER, J EDWARD, ON PASSENGER-CAR BRAKES	273, 376
Science	230
Screw sizes and lug attachment	271

**Screw Threads Division, S A E**

Activities	295
Personnel	115, 524
Report at annual meeting	128
Report at semi-annual meeting	524
Subjects assigned	508
Screws, sizes	271
Seat width	118

**Sections, S A E**

Activities	72, 145, 223, 296, 431, 535
Athletics at summer meeting	535
New officers	535

**Sections Committee, S A E**

Personnel	142
Report at annual meeting	85, 145
Segregation of raw stock	207
Selecting sales territory	151
Service	68
Service-man's critical estimate of automotive engineering (B M Ikert)	263
Servo principle of operation	285
Severe-service test with uncooled drum	160
Shale oil	191
Sighting, simplified methods of	63

**Sights**

Design of bomb dropping	63
Drift bomb	64
Silent chain and spur gear drives	491
Single-engine airplanes	26
Slipper aluminum pistons	331
Some aspects of air-cooled cylinder design and development (S D Heron)	231
Some notes on California top (P W Steinbeck)	366
Spark-plug, effect of position on power output and fuel-consumption	254
Special trains and pullmans for summer meeting	449
Specifications, bodies built according to	180
Spectroscopes	219
Spectroscopic analysis	219
Spectroscopic investigation of internal combustion (Thomas Midgley, Jr, and W K Gilkey)	218, 383
Spectroscopy	218

**Speed**

Estimation of ground	63
Minimum and maximum of airplanes	470
Spiral bevel gear drive on engine	494
Sports events at summer meeting	448
Sports program at summer meeting	449
Spring suspension and steering	215

**Springs**

Crane suspension	464
New system of suspension for automotive vehicles	463
Rear-axle suspension	463
Suspension and steering	215
Tire reaction	465

**Springs Division, S A E**

Activities	295
Personnel	115, 438, 532
Report at semi-annual meeting	532
Subjects assigned	438
Standard basic machine elements	271
Standardization	450

**Standardization**

Belt-speeds	271
British automotive vehicle	142
Commercial cars and trucks	186
Control dimensions	120
Current work	69, 224, 298, 433



## INDEX TO VOLUME X

545

General considerations	272	Railroad transportation	346, 448	Market	337
Hitches	271	Research session	446	Relation to farm implement	177
Magneto mountings	270	Special trains and pullmans	449	Requirements	177
Parts and fittings in oil field	5	Sports and entertainment	347	Statistical consideration	338
Sectional bodies	182	Sports announced	230	Steel and other standards	271
		Sports events	448	Suitability	339
		Sports program	449	Value of standards in manufacture	270
		Technical sessions	345		
		Written discussion of papers	448		
<b>Standards</b>		Super-machine-gun	226	<b>Traffic and Transportation</b>	
Basic machine elements	271	Supply and demand, law of	116	Economic efficiency of motor	418
Exhibit at Minneapolis Tractor Show	225			Economics of motor transport	415
First day of summer meeting devoted to	445			Efficiency	419
Hitches and belt-speeds	271			Essentials of air	30
Letter ballot on adoption of	260			Highway as it affects the automotive engineer	212
Steel and other	271			Highway engineering and instruction	272
Value of, in tractor manufacture	270				
		<b>T</b>			
<b>Standards Committee, S A E</b>		Take-up adjustment, general	265		
Attendance at meeting	130	Tappet-rods and overhead camshafts	489		
Division reports at semi-annual meeting	475	Tariff walls	165		
Letter ballot on adoption of standards	260	Taylor, C Fayette, on recent air-craft engine developments	204		
Meeting	121	Team-play, factory	150		
Personnel for 1922	113	Tear-down and inspection of engines	460		
Report at annual meeting	77	Technical sessions at summer meeting	345		
Reports of divisions	475	Temperature distribution in cylinders	232	<b>Transactions</b>	
Tentative schedule of division meetings	292	Temperature method of determining detonation	8	Charge for, deferred	261
Starting, ease of	18			Distribution	109
				Transition point	34
<b>Stationary Engine Division, S A E</b>					
Activities	295	<b>Temperature</b>		<b>Transmission Division, S A E</b>	
Personnel	115, 484	Cylinder, and power output	327	Activities	295, 434
Report at semi-annual meeting	484	Drawing, steel	48	Personnel	115, 291, 434, 508
Stationary internal-combustion engines	80	Effects of mixture-strength and cooling air-supply upon cylinder	232	Report at annual meeting	128
Status of the engineer in automotive economics (David Beecroft)	82	Exhaust-gas tests	173	Transmission, relation between fluid friction and efficiency	193, 372
Steel and other standards	271	Manifold vaporization and exhaust-gas	171, 402	Treasurer's report at annual meeting	85
		Quenching and drawing, steel	48	Trend of aviation development (J G Vincent)	25
		Templin, E W, on highway transportation as it affects the automotive engineer	212	Trolley-car, trackless	396
		Tentative schedule of division meetings	292	Trowbridge, Augustus, on photographic recording of engine data	351
		Test apparatus for propeller models	534		
				<b>Truck Division, S A E</b>	
		<b>Tests</b>		Activities	70, 295
		Absorption of water and oil in brake-linings	162	Personnel	116
		Acceptance of engines	458	Report at annual meeting	128
		Apparatus for propeller models	534	Subject assigned	508
		British engine	136	Trucks, brakes	289
		Desirable features of oil-friction testing machines	39	Truth about commercial aviation	51
		Determination of relative durability of brake-linings	161	Turbulence, combustion-chamber design and	315
		Developing a method for brake-linings	153, 387	Two-step charge	504
		Differences in oiliness of different lubricants shown by	37	Types of engines	138
		Endurance with a cooled drum	158		
		Equipment for brake-lining	154	<b>U</b>	
		Exhaust-gas temperature	173	Unemployment, industrial	224
		Finished forgings	210	Uniform and effective braking-power	278
		Flight and service of engines	461	United States, position of	166
		Friction of bearing metals	34	Unusual forms of camshaft drives	495
		Fuel	172	Upholstery, harmony in car	131, 400
		Gearset	194	Upholstery shape	117
		Heat of fuel	66	Urban and rural incomes	101
		Hot-plate	172	Use of molybdenum steel in the automotive industry (John D Cutter)	340
		Impact of tires	214		
		Measurement of effective volatility of fuels	20	<b>V</b>	
		Methods of testing steel	48	Value of farm animals, number and	295
		Oil consumption	514	Value of standards in tractor manufacture (P M Heldt)	270
		Pistons	319	Valve-gears	253
		Result of gearset	196	Valve-seat inserts in aluminum cylinder heads	250
		Routine for gearset	195		
		Service	38	<b>Valves</b>	
		Severe-service with uncooled drum	160	Adjustment	265
		Standard for engines	458	Mechanisms	496
		Steel, methods of	48	Vaporization and exhaust-gas temperatures, manifold	171, 402
		Uniform methods of oil	5	Vaporization, determining partial	20
		Thompson autorifle	134		
		Tire and Rim Division, S A E, report at annual meeting	129	<b>Varnishes</b>	
				Artificial-heat drying	391
		<b>Tires</b>		Care of automobile finish	15
		Impact tests of	214	Manufacture and application of automobile paints and	12, 388
		Pneumatic	426	Materials	12
		Pneumatic truck	214	Veal, C B, on commercial-body supply and service	179
		Reaction	465	Velocity, actual reaction	361
		Total sensible heats of engine fuels and their mixtures with air (R E Wilson and D P Barnard, 4th)	65	Versatility, importance of	467
		Touceda, Enrique, on pertinent facts concerning malleable iron castings	53, 375	Vincent, J G, on trend of aviation development	25
		Tracer and incendiary bullets	220	Viscosity and friction (W H Herschel)	31, 369
		Trackless trolley car	396		
		Tractor Division, S A E, report at annual meeting	128		
		Tractor engineering	79		
		Tractor market (J S Clapper)	337		
		Tractor meeting, Minneapolis	167		
				<b>Viscosity</b>	
		<b>Tractors</b>		Effect in the complete-film-lubrication regime	31
		Distributors' opinions	339	Estimation at one temperature from observed viscosity at another temperature	33
		Engineering	79		
		Magneto mountings standardized	270		

Gravity and	21	W	WILSON, R E, ON TOTAL SENSIBLE HEATS	
Influences of oil and effects of dilution	521	Wages	OF ENGINE FUELS AND THEIR MIXTURES WITH AIR	65
Relation of absolute to the readings of instruments ordinarily used	32	WARNER, E P, ON AIRPLANE PERFORMANCE FORMULAS	Wind-tunnel	146
		Washington Conference	Wind-tunnel, use of	469
		Weight, limitation on roads	Wing joint, function of	467
		Welfare work		
		Wheat-producing territory, recovery in	170	
<i>Volatility</i>			<i>Woods</i>	
Alternative apparatus for determining	19	<i>Wheels</i>	Moisture-content of	392
Main dependency	21		Moisture in	348
Mean	308		Paint protection for	348
Measurement of effective	20		Protectiveness of paint	349
VON AMMON, S, ON DEVELOPING A METHOD FOR TESTING BRAKE-LININGS	153, 387	Abrasive safety code	World an economic unit	166
		Moisture-content of wood	World economic situation	165
		Who must have automobiles	Written discussion of papers at summer meeting	448





